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**Physics of Boundaries and Their Interactions in Space Plasmas**

Dr. Nojan Omid  
Dr. Homayoun Karimabadi  
Dr. Dietmar Krauss-Varban

SciberNet, Inc.  
5414 Oberlin Drive, Suite 251  
San Diego, CA 92121

## **I. 2-D Global Simulations**

We are continuing our work on the problem of the origin of high energy particles in the cusp. We have selected an event and have constructed simulation parameters similar to it. We have several production runs running simultaneously. We have started to analyze the results of some of our runs and have worked on the preparation of an abstract for the upcoming Fall AGU meeting. Further, we have started to write up our results of our previous 2-D global simulations for publication in the Journal of Geophysical Research. Since we have not published any detailed results of our 2-D global simulations before, this manuscript will concentrate more on what type of problems can be addressed with such simulations as illustrated by a few examples. More specifically, our manuscript will include discussion of the formation and the general properties of the different regions separated by boundaries as the solar wind interacts with the earth's magnetosphere. We will include plasma and field signatures for each region. One of the most interesting results of these runs is the formation of slow shocks in the magnetotail as a result of high latitude reconnection. These slow shocks have properties that are quite distinguishable from those expected during the usual Petscheck reconnection model.

## **II. Simulation of FTEs**

The first part of our simulation of the FTE using our 3-D hybrid code has finished. Our analysis indicates that the reconnection has resulted in a FTE which in turn has created a bulge in the magnetosphere. This would be identified as a magnetospheric FTE in the data. As the bulge penetrates into the magnetosphere, it loses its strength. This is due to the fact that we have localized our reconnection site in all three directions. We are planning on making a second run where we would allow finite resistivity in the x-direction over a larger region so as to allow the reconnection to continue in the magnetosphere. Another interesting effect is the creation of a large velocity shear resulting from the dragging of the field lines as the bulge moves into the magnetosphere. This velocity shear in turn leads to the excitation of the Kelvin-Helmholtz instability. We have also started a 2-D run to see what if any of the above features can be captured in a 2-D simulation.

## **III. MHD versus Kinetic**

We have started a collaboration with Drs. Ku and David Sibeck on the comparison between MHD and hybrid simulations of FTEs. Drs. Ku and Sibeck have worked on the detailed properties of FTEs as predicted in 2-D MHD simulations. Give our own work that shows Hall effects as well as kinetic processes are quite important in the formation and evolution of FTEs, we have started to compare the prediction of the two approaches to see to what extent FTEs can be described by MHD. We have made a hybrid run and made the data available to them so that they can start performing the same type of analysis that they had performed in their MHD simulations. We are working on submitting an abstract for the Fall AGU meeting.

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13. ABSTRACT (Maximum 200 words)  This report describes the work done by ScriberNet, Inc. during the month of August. During this time, we started to write up our results on 2-D global hybrid simulations of the magnetosphere. We also worked on submitting an abstract for the upcoming Fall AGU meeting on our study of quasi-parallel shocks and nature of the cusp. We also started to analyze the first part of our continuing run on the kinetic formation of FTEs. The results illustrate how a magnetosphere results in the creation of a velocity shear which makes the system unstable to excitation of the Kelvin-Helmholtz instability. Finally, we have started a new collaboration with Drs. Ku and Sibeck on the comparison of MHD and kinetic models of FTEs.				
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